

# PowerLink

REMOTE AC POWER  
SEQUENCE CONTROLLER

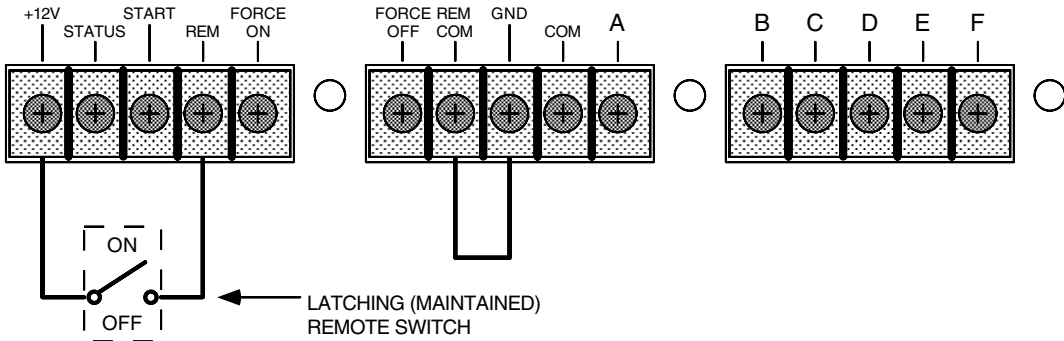


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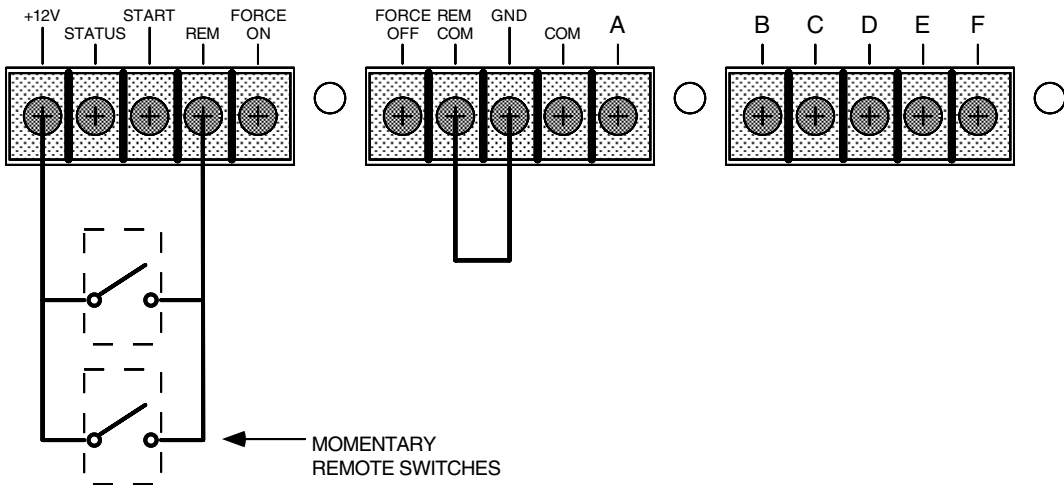
## QUICK START

The illustrations below show several of the most common hookup methods for the PowerLink. There are many other methods and features, however, so please refer to the rest of this manual for more details if necessary.

For single unit operation with turn on from local or one remote location.  
Default is maintained contact closure.



Multiple remote switches require use of Momentary Mode. Open the unit and move suitcase jumper from JMP2 to JMP1.



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## INTRODUCTION

*Congratulations on your purchase  
of a Furman PowerLink Remote AC Sequence  
Controller.*

*Please read this manual completely before  
installing your PowerLink.*

## FEATURES

- **Allows you to trigger six power control devices in a sequenced fashion**
- **Six circuits, each with a front panel status indicator**
- **Circuits can be powered up and down in sequence**
- **Three position switch allows each circuit to be part of the sequencing, or to be switched on/off independently**
- **Six low level relays provide contact closure (or opening) to control and sequence other units, such as additional PowerLinks, Furman PowerPorts, MiniPorts, ASD-120 Sequenced Power Distros and the PS-8R and PS-PRO Power Sequencers**
- **Sequence timing can be initiated from unit or remotely using low voltage control wires**
- **Front panel key switch for security**
- **Compact single rack space package**
- **Three unswitched AC circuits – two on the rear, one on the front**

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## DESCRIPTION

The Furman PowerLink is a compact, low-cost rackmount Remote Sequencer that provides timing for up to six power control devices, turning them on and off in a preset sequence. The delay interval between the turn-on or turn-off of each device and the next in sequence is user-adjustable via an internal trimpot.

PowerLink can work with a group of relay-controlled circuits such as Furman MiniPorts, to create a very flexible power control system that can expand to handle as many circuits carrying as much current as needed.

An on or off sequence can be initiated from the PowerLink itself, using the built-in high-security locking key switch, or, if the key switch is set to enable Remote operation, by one or more momentary or maintained-action switches in distant locations.

The outputs of the PowerLink are low power relay contacts, accessible through rear-panel screw terminal strips. Outputs may be configured to be normally-closed or normally-open by internal jumpers. All input and output commons are electrically isolated to avoid the creation of ground loops.

Power sequencing is needed whenever various kinds of equipment must be powered up or down in groups, rather than all simultaneously. In audio systems, sequenced powering is often necessary to allow turn-on transients from low level preamplifiers and processors to settle down before any power amps are turned on. This is because simultaneous powering can result in a loud, annoying, and potentially destructive “pop” reaching the speakers. In any large system whose components present an inductive load to the AC line (including electric motors, power supplies, and power amplifiers of all kinds), sequenced powering can avoid excessive inrush currents that can

cause circuit breakers to trip even though the steady-state currents are not excessive.

The PowerLink’s front panel provides a three-position switch for each control output that allows each control output to be part of the power up/down sequence, or to remain on or off apart from the sequence. It also provides an LED that indicates when the circuit is on.

The outputs of the PowerLink are low power relay contacts, which can control Furman PowerPorts, MiniPorts, PS-PRO and PS-8R Power Sequencers, or any other circuits that need to know when a particular time delay has elapsed. In larger systems, one or more additional PowerLinks can be installed in remote locations and operated via low-voltage control wiring, providing the capability of controlling power sequencing for a system of any size.

## CONTROLLING ON/OFF SEQUENCE

A normal, time-delayed on or off sequence may be initiated in either of two ways: locally, via the front panel key switch, or remotely, via a remotely located maintained or momentary switch connected to the PowerLink’s rear panel terminal strip. In addition, the behavior of any individual circuit may be overridden by its corresponding front panel ON/SEQ/OFF toggle switch.

The PowerLink’s control circuits turn on the circuits in order from A to F when sequencing on, and turn the circuits off in the reverse order from F to A when sequencing off. The time for each step is internally adjustable with a trim pot, with a range of 0.2 to > 12 seconds per step. (Total time for the entire sequence is from 1 second to > 1 minute).

**Local control:** Turning the key to the ON (or possibly REM) position initiates an on sequence. Please

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note that in the absence of any signal applied to the remote input, the REM position defaults to on. (If the PowerLink has been changed from the factory-preset Maintained Mode to Momentary Mode, you must also press the START ON/OFF SEQUENCE button. However, for purely local control, you should leave the mode set to Maintained.)

When the unit is turned on with the key switch, the PowerLink will stay on if all of its six circuits are already on, or, if all circuits are off, will begin turning on circuits starting with circuit A, then B, etc. until all circuits are on. If the unit was in the middle of sequencing off and had not yet turned off all circuits, the lowest circuit that was currently off will go on, so the sequence reverses without ever deactivating the circuits that had not yet gone off. The lowest off circuit turns on within 0.2 seconds, regardless of the setting of the delay time trimpot. The next and all following circuits turn on at intervals controlled by the trimpot. The factory default setting is approximately 1 second per step.

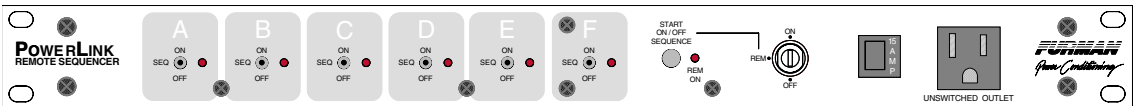
When the unit is turned on with the key switch, the PowerLink will stay off if all circuits are already off, or, if all circuits are on, will begin

turning off circuits starting with circuit F, then E, etc. until all circuits are off. If the unit was in the middle of sequencing on and had not yet turned on all circuits, the highest circuit that is currently on will go off, so the sequence reverses without ever activating the circuits that had not yet turned on. The highest on circuit turns off within 0.2 seconds, regardless of the setting of the internal delay time trimpot. The next and all following circuits turn off at intervals controlled by the trimpot.

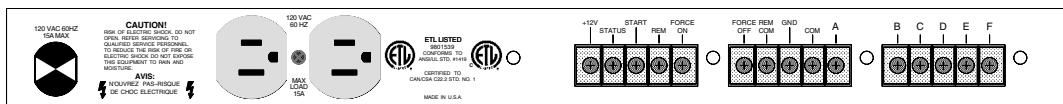
**Remote Control:** In the REM (center) position, an on or off sequence is initiated by one or more switches connected to the rear panel inputs, or, in Momentary mode, also by the START ON/OFF SEQUENCE button. The PowerLink responds exactly as it does as described in the preceding section on local control. See the next section for a discussion of Remote Operating Modes.

When the key is in either the ON or OFF position, the PowerLink's sequencing circuits will not respond to the rear panel remote control inputs. If the key switch is later returned to the REM position, the signals supplied to the rear panel remote inputs will again control the unit.

**Overriding a sequence:** The PowerLink circuits



PowerLink front panel



PowerLink rear panel

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are turned on and off by six low level relays. The relays are controlled by drivers that can be activated either by the internal control circuits, or directly by a three-position toggle switch. The six ON/SEQ/OFF toggle switches (one per circuit) can override the sequencing circuits, and are intended as a secondary means of control to allow individual on/off control of each circuit for diagnostic purposes. Following are the three positions of each ON/SEQ/OFF toggle switch. Up: Circuit is on regardless of state of sequence control circuits. Center: Circuit is controlled by the sequence circuits (the normal position). Down: Circuit is off regardless of state of sequence control circuits. The center position is the normal operating position, and allows control by the sequencing circuits.

**Signal relays:** The PowerLink's relays are accessible by the rear panel terminals labeled A through F. These relays have an isolated common (labeled RELAY COM) that is independent of the chassis and signal grounds of the PowerLink, for easy interfacing to virtually any other device that could act as a slave to follow the PowerLink.

There is an internal jumper for each signal relay that allows selection of the normally closed or normally open contacts between each of the A to F terminals and RELAY COM. The factory default is that the contacts are open when the associated circuit is off (normally open). The relay contacts may be easily converted to normally closed operation by moving six "suitcase" jumpers on the PowerLink's circuit board. To do this, first disconnect the unit from AC power. Remove the four screws that secure the top cover. There are twelve small two-pin connectors labeled J1 through J12, located near the left side of the largest circuit board. Six of the twelve are joined by small black suitcase jumpers. To change the mode, gently pull them up and reposition them in accordance with Table 4 on page 7. Replace the

top cover and screws.

## REMOTE OPERATING MODES

If the PowerLink will be controlled locally only, you may skip this section and the next section of the manual.

There are three remote operating modes available: Maintained Mode/Normally On, which is the default, Maintained Mode/Normally Off, and Momentary Mode.

The Momentary Mode on the PowerLink shares the same characteristics as the Momentary Mode on the Furman PowerPort, MiniPorts, ASD-120 Sequenced Power Distro, and PS-PRO and PS-8R Power Sequencers. Remote inputs (REM, FORCE ON, FORCE OFF) are controlled by applying at least 5 VDC or 6 VAC between the input and the REM COM terminal.

This is the default control logic on all of our existing and past power products. However, the PowerLink's inputs are enhanced in the following ways: (1) They are polarity independent, and work with positive, negative or AC control signals. (2) They are optically isolated. The remote control inputs have a floating common.

## MAINTAINED MODE/NORMALLY ON (DEFAULT)

In the absence of any signal applied to the remote input, the PowerLink will sequence on as soon as power is applied, and the key switch is turned to REM or ON. This is Maintained Mode/Normally On. In this mode, voltage must be continually applied to the REM input to keep the PowerLink's circuits off, when the key switch is in the REM position. This mode is compatible with all other Furman power products' REM inputs. Internal jumpers allow selection of either of two other optional modes, as described below. Please

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also see Table 4, Internal User Settable Jumpers, on page 7.

## MAINTAINED MODE/NORMALLY OFF

This mode is just the reverse of the Maintained Mode/Normally On mode. The PowerLink's circuits stay off until voltage is applied to the REM input. Voltage must be continually applied to keep the unit on, when the key switch is in the REM position. This setting will be useful to interface to other brands of controller that have positive control logic (i.e. they put out a signal to indicate that attached gear should turn on). In addition, since the REM inputs are optically isolated, this mode allows the PowerLink to sequence on if some other source of AC line voltage is turned on.

## MOMENTARY MODE

In Momentary Mode, the PowerLink has “memory” — it only needs a momentary signal to change its state from on to off, or off to on. When first plugged in (or after power is lost and re-applied for any reason) the “memory” state is off. It will stay off until sequenced on by the front panel START ON/OFF SEQUENCE pushbutton or a momentary connection of the REM IN terminal to a voltage source of at least  $\pm 5$  VDC or 6 VAC (130V max). The sequence starts on the rising edge of the signal. The rear panel +12V output may be used as a trigger source. This is further explained in the section “Setup for Remote Operation” below.

Once the PowerLink is on (or is sequencing on), applying voltage momentarily to the REM input starts switching the PowerLink off, in descending sequence. Pushing the START ON/OFF SEQUENCE button on the front panel is effectively the same as applying a signal to the REM input (although the actual connection is applied to an internal node, not to the REM terminal on the rear barrier strip).

In Momentary Mode there are two additional inputs that are not required, but may be useful

where multiple PowerLink's are controlled from remote locations. Please see the section “Compatibility with Other Furman Products.”

## SETUP FOR REMOTE OPERATION

The barrier terminal strip on the PowerLink rear panel allows a switch (or switches) to be connected to turn the unit on or off at a distance, and provides various power, status and relay closure outputs. In the most basic configuration, only two Class 2 wires and an SPST switch are needed to initiate an on or off sequence. The switch may be either a momentary or maintained-contact type. An LED may also be installed at the remote end to indicate that the power is on, but will require a third wire.

## MOMENTARY VS. MAINTAINED CONTACT SWITCHING

An on-off switch of either kind may be used to actuate the PowerLink's remote operation. Maintained switches, such as most toggle switches and push-on/push-off button switches, and including the Furman RS-1 wall mount key lock switch, are open until actuated, then stay closed until actuated again. Momentary switches, including the Furman RS-2 switch, are usually pushbutton types that are normally open and stay closed only as long as the button is pressed.

Maintained switches are generally most convenient when there is only one remote location. When more than one location is required, momentary switches offer the advantage that either the turn-on or the turn-off sequence may be started from any location.

The PowerLink is shipped factory-set for maintained operation. It may be easily converted to momentary operation by moving a jumper plug on the PowerLink's circuit board. To do this, first

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disconnect the unit from AC power. Remove the four screws that secure the top cover. There are three small two-pin connectors near the center of the largest circuit board. A small black suitcase jumper can be moved to set the mode. (Please see Table 4 on this page for jumper numbers and function description.)

## MAINTAINED MODE/NORMALLY ON

A simple connection of the REM IN terminal to the +12V terminal initiates an OFF sequence. Disconnecting it initiates an on sequence. If the cable run is long, it is recommended that the REM IN wire be tied to the PowerLink's GND terminal during on operation rather than leaving it floating. This will require the use of a third conductor and a double-throw switch. NOTE: The REM COM is floating with respect to the ground of the +12V source. To use the +12V with the REM input, the REM COM terminal must be connected to the adjacent ground terminal on the rear barrier block.

In Maintained Mode, *do not use* the START ON/OFF SEQUENCE button on the front panel. If you do press the button, the PowerLink, if on, will start an off sequence that will last only until you release the button.

## MAINTAINED MODE/NORMALLY OFF

A simple connection of the REM IN terminal to the +12V terminal initiates an on sequence. Disconnecting it initiates an off sequence. The other instructions are identical to those in the Maintained Mode/Normally On section above. Again, *do not use* the START ON/OFF SEQUENCE button on the front panel. If you do press the button, the PowerLink, if off, will start an on sequence that will last only until you release the button.

## MOMENTARY MODE

A momentary connection of the REM IN terminal

to the +12V terminal will start the PowerLink's on/off sequence.

The +12V output on the rear barrier strip can be used to trigger the REM input. As in Momentary mode, the REM COM must be connected to the adjacent GND terminal. This mode also requires only two wires in the simplest case, +12V and REM. You may wire any number of momentary switches in parallel. In this mode the START ON/OFF SEQUENCE button can also be used to trigger an up/down sequence.

JMP1	Momentary Mode
JMP2	Maintained Mode, Normally ON (Factory Default)
JMP3	Maintained Mode, Normally OFF
	NOTE: Connect only ONE jumper of the JMP1-JMP-3 group at a time
J1,2,5,6,9,10	Normally Open connection for low level relays A,D,B,E,C,F (factory default)
J3,4,7,8,11,12	Normally Closed connection for low level relays A,D,B,E,C,F

Table 4: Internal User Settable Jumpers

## STATUS OUTPUT

In all models, the STATUS terminal is an output that may be used to illuminate an LED at the remote location to indicate that power is available at the PowerLink's circuits. If it is high (+12V), the unit is on (or at least in the process of sequencing on); if low, the unit is off (or sequencing off). Simply connect the indicator LED between STATUS and GND (a series resistor is not required). If the LED does not light when the switch is in the ON position, check the polarity and reverse the LED leads if it is wrong. If a Furman RS-1 is the controlling switch, contact Furman's Tech Support department for the proper wiring diagrams. The STATUS output is a 12V source, current limited to



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10 mA. If you wish to use the STATUS output as a voltage signal to some monitoring device, and also wish to light a status LED on a remote panel, put a 1 K Ohm 1/4-watt resistor in series with the LED.

## MULTIPLE UNITS

You can use more than one PowerLink to control and sequence additional equipment. To control devices remotely with one or more remote switches, connect the REM and REM COM terminals of all units together. You *might* need to connect the +12V or GND terminals. Be sure that the mode (momentary or maintained) of all units is set the same. Connect a single maintained switch or one or more momentary switches to the nearest PowerLink, as discussed in the sections above.

Because the trigger sources provided on the rear of the PowerLink (START and +12V) have a GND that is isolated from the REM COM, it may be necessary to connect GND to REM COM on all units. This will *usually* be needed. The GND and REM COM would be left isolated if the PowerLink(s) are to be signalled by some other source of voltage, such as the AC line, or a third party controller. The +12V output or the START output on a single PowerLink has enough output current to switch dozens of REM inputs simultaneously, however, it is harmless to parallel the +12V outputs.

If multiple PowerLink's are controlled by one or more momentary remote switches, they will all change state (from on to off or vice versa) on each rising edge of the voltage on the REM input terminal. Pushing the START ON/OFF SEQUENCE button will affect *only* the local PowerLink unless the START terminal on the rear barrier strip of each unit is connected to the REM terminal directly below it. To keep all units in sync, please be sure to make this connection on all units. Once

the START and REM terminals are connected on all units, any remote switch *and* any of the START ON/OFF SEQUENCE button on *any* unit's front panel will toggle *all* the units. The key switch on each unit's front panel will turn off (or on) any individual unit without affecting the other units.

The STATUS lines work the same in either mode. Each reflects the true state of the sequence control circuit of its unit, and is affected by both the "memorized" state and by the front panel key switch. A separate LED must be used to indicate the status of each PowerLink. NOTE: The STATUS line will *not* reflect changes caused by the ON/SEQ/OFF mini-toggle override switches. The STATUS output only indicates if the sequencing control circuits are set to on or off.

To take care of the special (hopefully rare) case of having several PowerLinks in parallel that somehow get out of sync such that every time a remote button is pushed, some units turn on and others turn off, there is a special feature of the REM signal line: Pushing the "START ON/OFF SEQUENCE" button and holding it down for four seconds, or holding the REM line high for at least 4 seconds will force all units to the off state, which will put them back in sync. This may be the only way to re-sync units other than disconnecting AC power to all the units. Remember — operating the front panel key switch does *not* affect the stored state of the unit, even though it does temporarily turn the outputs off. Please refer to the "Compatibility ..." section of this manual below for another way to keep PowerLink's in sync.

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## ADDITIONAL REMOTE FEATURES:

- STATUS output signal on the rear panel allows remote indication of whether the unit is on or off (high indicates the unit is on or sequencing on, low that the PowerLink is off or sequencing off)
- +12V output terminal on rear has 40 mA capacity to power many external devices
- +12V supply and STATUS terminals are true voltage sources, with current limiting circuits that prevent damage if the output is heavily loaded or shorted. This allows direct connection of an LED to the STATUS output, or if a voltage is desired from the STATUS output, an external resistor in series with the LED (at least 1K) will allow the STATUS output to rise to 12 VDC while simultaneously lighting the LED.
- A START output on the rear goes to +12V (with a 1K source impedance) when the front panel momentary START ON/OFF SEQUENCE push button is pushed. This allows the PowerLink to send a signal to other units that can be turned on and off by a momentary voltage signal. Note: This start function is merged with the REM input on other Furman products.

## COMPATIBILITY WITH OTHER FURMAN PRODUCTS

The PowerLink's remote control features are identical to those on the ASD-120 Sequenced Power Distro, and similar to those on the PS-8R and PRO Series with the following enhancements: A separate LED (next to the front panel START ON/OFF SEQUENCE button and labeled REM ON) shows the "memorized" state. This LED will be on whenever the remote control circuits are set to turn the unit on, off if the remote control circuits are trying to turn the unit off. (Other Furman products blink one of their status lights to indicate the remote status.)

Because the remote control inputs are optically isolated, they have a separate "ground" from the chassis and control logic. In some cases this "ground," labeled REM COM, may need to be connected to the signal ground GND. The PowerLink has three remote input terminals. The REM input is used in both Momentary and Maintained modes, as described in the previous sections on remote operating modes. FORCE ON and FORCE OFF work only in momentary mode, and are the same as the ON and OFF inputs of the PowerPort. If the unit is off, applying power momentarily to the FORCE ON input will set the memorized state to on, which will start the on sequence. Applying further control signals (of any duration) to this input will have no effect. If the unit is on (or sequencing on) applying power momentarily to the FORCE OFF input will set the memorized state to off, which will start the off sequence. Applying further control signals (of any duration) to this input has no effect.

The FORCE ON and FORCE OFF inputs provide an assured method of controlling multiple PowerLinks, with no possibility that the units will get out of sync with each other, as can happen when using the regular REM toggle input. These two inputs also make the PowerLink directly compatible with the PowerPort.

As is the case with the PowerPort, the disadvantage of using the separate ON and OFF inputs instead of the single REM toggle input is that two momentary switches (and at least three wires) are required at every remote control location.

Where a single PowerLink is controlled from multiple remote locations there is no advantage to using the separate ON and OFF inputs, unless the switch location makes it difficult for you to tell whether the system is currently on or off.

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## LIMITED WARRANTY

The Furman PowerLink is warranted against failures due to defective parts or faulty workmanship for a period of three years after delivery to the original owner. During this period, Furman will make any necessary repairs without charge for parts or labor. Shipping charges to the factory or repair station must be prepaid by the owner; return shipping charges (via UPS Ground) will be paid by Furman.

This warranty applies only to the original owner and is not transferable. Also, it does not apply to repairs done other than by the Furman factory or Authorized Repair Stations.

This warranty shall be cancelable by Furman at its sole discretion if the PowerLink unit has been subjected to physical abuse or has been modified in any way without written authorization from Furman. Furman's liability under this warranty is limited to repair or replacement of the defective unit.

Furman will not be responsible for incidental or consequential damages resulting from the use or misuse of its products. Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Warranty claims should be accompanied by a copy of the original purchase invoice showing the purchase date (if a Warranty Registration Card was mailed in at the time of purchase, this is not necessary). Before returning any equipment for repair, please read the important information on service below.

## SERVICE

Before returning any equipment for repair, please be sure that it is adequately packed and cushioned against damage in shipment, and that it is insured. We suggest that you save the original packaging and use it to ship the product for servicing. Also, please enclose a note giving your name, address, phone number and a description of the problem.

NOTE: All equipment being returned for repair must have a Return Authorization (RA) Number. To get an RA Number, please call the Furman Service Department, (707) 763-1010, Ext. 120 or 121, between 8 am and 5 pm U.S. Pacific Time. Please display your RA Number prominently on the front of all packages.

## **SPECIFICATIONS**

### **VOLTAGE AND CURRENT**

Input Voltage: 120 VAC, 50/60 Hz.  
Power Consumption: 8.4 watts

### **POWER SEQUENCING**

Delay Interval: 0.2 to 10 seconds per step  
(adjustable with internal trimpot)

### **REM CONTROL INPUTS**

Optically isolated, AC or DC drive, 12K ohm input impedance. Operates at 5 VDC or 6-130 VAC.  
Max 130 VAC from REM COM to chassis

### **SIGNAL RELAY OUTPUTS**

Common isolated from chassis and control ground.  
130 VAC max from relay common to chassis.

Relay can switch 1/2 amp max @ 125 VAC,  
or 1/2 amp max @ 24 VDC.

Internally configurable to normally closed  
or normally open

### **AC OUTLETS**

Two unswitched convenience circuits  
on the rear, and one on the front

### **MECHANICAL:**

Weight: 5.5 lbs (2.5 kg)

Dimensions: 1.75" H x 19" W x 7.125 " D  
(4.4 x 48.3 x 18 cm)

Construction: Steel chassis, zinc chromate plating;  
.125" brushed and black anodized aluminum  
front panel.

Safety Information: All current-carrying components  
are UL/CSA listed.

# ***FURMAN***

Furman Sound, Inc.  
1997 South McDowell Blvd.  
Petaluma, California 94954-6919 USA  
Phone: 707-763-1010  
Fax: 707-763-1310  
Web: [www.furmansound.com](http://www.furmansound.com)  
E-mail: [info@furmansound.com](mailto:info@furmansound.com)  
Made in China